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A guide to assist those concerned in planning adequate, well-designed facilities for departments of vocational agriculture that will serve their communities in the future. The program of vocational agriculture is an integral part of the total educational program of a school and considerable thought and careful study should be given to locating the department. Vocational agriculture is a community program in which farmers, ranchers, and other agriculture personnel participate in organized instruction. The need for a classroom of adequate size should be recognized along with all related environmental factors, such as finishes, lighting, heating, cooling and equipment. A storage room, readily accessible to the classroom, should be provided for the storage of instructional supplies and teaching aids, and sufficient office space to permit convenient and safe storage of all official records and correspondence of the department be provided. Considerable study and planning should be undertaken when planning the agriculture mechanics laboratory. A locker room, shop storage facilities and surfaced apron should also be provided. (RK)

A GUIDE FOR PLANNING FACILITIES FOR VOCATIONAL AGRICULTURE IN TEXAS

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CHAPTER I

INTRODUCTION

This study has been conducted because the current guide for planning vocational agriculture facilities in Texas no longer meets the needs for modern day vocational agriculture. In April, 1966, Mr. George Hurt, Director of Vocational Agriculture Education, appointed a committee to revise the present facility standards.

The use of farm power and machinery is increasing very rapidly, therefore demanding more training in the skills taught in the agriculture mechanics laboratory. The increased size of farm equipment used for instructional purposes has necessitated more shop space.

The author has studied the guides for planning vocational agriculture facilities from fourteen states; these guides are listed in the bibliography. Also, the author has experienced the planning and checking on the construction of a totally new vocational agriculture department and has gained much knowledge from this experience.

Additional facilities such as school farms, feeding pens, and greenhouses are important facilities for vocational agriculture departments due to the strong emphasis placed on livestock production and plant science. These facilities are not included in this study because the extent of the instructional program and expected student enrollment should determine the size and type of facilities provided.

Some vocational agriculture departments will enter into the pre-employment laboratory training phase of vocational agriculture and will demand facilities far greater than those recommended in this guide.

The purpose of this study was to develop a guide to assist local boards of education, school administrators, teachers of vocational agriculture and the personnel of the Texas Education Agency in planning facilities for departments of vocational agriculture in Texas.

CHAPTER II

LOCATION OF VOCATIONAL AGRICULTURE FACILITIES

The program of vocational agriculture is an integral part of the total educational program of a school, therefore, considerable thought and careful study should be given to locating the department. Vocational agriculture is a community program in which farmers, ranchers, and other agriculture personnel participate in organized instruction.

Some factors which should be considered in locating the department are:

1. Amount of campus space available.
2. Easily accessible to public entrance.
3. Sufficient parking space available.
4. Department located on level ground with good drainage.
5. Department located with private entrance to the vocational agriculture department when connected to main school building.
6. Shop located and designed to avoid disturbing other classes.
7. Type of heating and cooling system to be used.
8. Total vocational agriculture facility constructed as one unit or as a part of the entire school plant.
9. If vocational agriculture facilities are part of total school plant, department should be located on ground level.

The vocational agriculture department may be a separate building or a part of the main building. Some of the advantages of having a separate building for vocational agriculture are:

1. If the building is properly located, there may be less disturbance to other classes due to the noise created in the vocational agriculture shop.
2. Many phases of work in vocational agriculture have certain undesirable odors. For example, at certain times animals may be temporarily housed at the vocational agriculture department for teaching purposes. A vocational agriculture building separate from the main building would decrease the odor reaching the main high school building.
3. Vocational agriculture students often participate in field trips, and the movement to and from the classroom could be a disturbance to other classes if the vocational agriculture department was connected to the main high school building. A separate building for the vocational agriculture department would reduce the amount of confusion.

Some advantages of having the vocational agriculture department connected to the main high school are:

1. The vocational agriculture department would be more convenient, which is very important during periods of inclement weather.

2. Tendency to unite the vocational agriculture department more closely with the total high school program.

3. Uniformity of buildings on the campus.

4. Custodian and maintenance service is more likely to be included for the vocational agriculture department.

5. The possibility of more efficient use of space.

6. Vocational agriculture facilities are more likely to be included when there is a bond issue presented.

7. Cost of installing heating and cooling systems may be decreased.

8. May cost less to operate utilities if they can be metered at one location.

In some cases, the separation of the classroom and the shop may be necessary. This situation should be avoided if at all possible; however, if this situation is necessary, a covered walkway should be provided between the shop and classroom to protect students from the weather.

CHAPTER III

PLANNING THE VOCATIONAL AGRICULTURE FACILITIES

Planning the Classroom

The need for a classroom of adequate size should be recognized. The vocational agriculture classroom must be large enough to accommodate the largest class to be taught during a given period. This group may be an in-school or adult group. If the Future Farmers of America meetings are to be held in the classroom, it would be desirable for it to be large enough to seat the entire membership as the room will be used for various community agricultural meetings.

Size

The Texas Education Agency currently recommends a minimum of 1000 square feet for the classroom.(6) With the increase of organized adult work by vocational agriculture teachers, the recommendation for classroom size is no longer adequate in many instances. A conference room arrangement of the tables and chairs is recommended for the vocational agriculture classroom in order to facilitate the use of the discussion method of teaching. This arrangement necessitates more classroom space. A minimum of 1200 square feet of floor space should be provided. In two teacher departments, the second classroom should contain a minimum of 750 to 800 square feet of floor space.(12) A minimum of 35 square feet of floor space per student should be provided for the largest class to be taught. These are the recommendations of the states of Minnesota(2) and Arizona.(3) The minimum width of the classroom should be 26 linear feet.

Location

The classroom should be located so that the students and teacher have direct access to the shop and office.

Floor

Concrete floors covered with a vinyl asbestos tile is recommended.

Ceiling

The ceiling should be acoustically treated to absorb the noise. Perforated acoustical board at least one-half inch in thickness will prove satisfactory.

Interior Finish

The interior finish should contribute to pleasant, comfortable working conditions. The ceiling should be finished with flat white paint which has an 85 percent reflection factor.(6)

The walls should be finished with a minimum of 60 percent reflection factor paint, or the upper walls should have 60 percent light reflection factor and the lower walls 40 percent.

In schools where the interior finish is properly planned, it fosters balanced visual conditions, reduces eyestrain, and facilitates both learning and teaching by lessening classroom fatigue.

Lighting

The artificial lighting system may be flourescent or incandescent. It is recommended that 75 foot candles of light be provided for all working surfaces.

Wall switches to control the lights should be located near the classroom doors and should be arranged so that fixtures may be turned on in groups.

Heating and Cooling

The heating and cooling of the classroom should be individually controlled. If the vocational agriculture department is a wing of the main school plant, controls should be installed so that heating or cooling of the vocational agriculture department is independent of the total school plant.

Chalkboard

A minimum of 20 linear feet of chalkboard space at a width of 4 feet should be provided.(5) The board should be located so that it is easily seen by all students.

Bulletin Board

A bulletin board of adequate size should be available in the classroom. The minimum amount provided should be 30 square feet.(5) The bulletin board should be placed at such a point to attract the attention of persons entering or leaving the room while at the same time permitting normal instructional usage.

Electrical Outlets

Grounded type double service receptacles should be located at 10 foot intervals on each wall. At least one outlet should be located on each wall.

Furniture and Demonstration Table

The central area of the classroom should be free of all obstructions except movable furnishings. A demonstration table should be provided for the teacher. The demonstration table should have an acid-proof top and be equipped with a sink, water, electrical outlets, and gas for heating. It should be located so that all students can clearly observe demonstrations.

Tables and chairs are most desirable for student use in the vocational agriculture classroom. The finish on the desk, tables and chairs should be non-glossy and blend with the color of the walls, floor, ceiling, display cases and cabinets. A well braced table, 30 inches high, 60 inches long, and 30 inches wide should be provided for each two students in the largest class to be taught. The teacher should be provided with a desk and chair in the classroom.

Classroom Storage Racks

The amount of notebook and record book racks, cabinets or shelves needed will vary according to the number of students enrolled in vocational agriculture classes. The magazine rack should be at least 20 feet long.(6) These facilities should be planned when designing the entire building and should be included in the contract for construction.

Storage Room for Classroom

Teachers of agriculture use many teaching aids in their instructional programs. These include movie projectors, film strip machines, slide projectors, tape recorders, charts, various tools and pieces of farm equipment for illustration purposes and countless numbers of specimen of farm products, insects, etc. Also, space is needed for F.F.A. equipment and exhibits. Consequently, a storage room, readily accessible to the classroom, should be provided for the storage of instructional supplies and teaching aids. In single-teacher departments, a minimum of 100 square feet should be provided for this purpose. In multiple-teacher departments, a minimum of 200 square feet is desirable.

(1) The room should be wide enough to allow storage shelves for text books. Shelves for books should be constructed so that the height may be adjusted.

In multiple-teacher departments the storage room should be located conveniently to each classroom so that it will not be necessary to go from one classroom through another to get to the storage room. This room should be rodent proof to provide storage of feeds and grains used in classroom instruction.

Office

The teacher of vocational agriculture needs sufficient office space to permit convenient and safe storage of all official records and correspondence of his department. In addition, he usually prepares instructional materials in the office and consequently keeps on file the professional and technical materials needed in such work.

The office should be conveniently located with glass panels that permit the teacher to have a clear view of the classroom and shop.

Sufficient space should be provided for the teacher's desk and chair, filing cabinets, bookcases, record storage, and at least two chairs for visitors. A minimum of 120 square feet of floor space should be provided in a single-teacher department for this purpose. Additional space will be required in multiple-teacher departments at the rate of 60 square feet per teacher.(13) Sufficient duplex convenience electrical outlets should be provided and the lighting should be similar to that provided in the classroom.

It is desirable to include a faculty restroom adjacent to the office. This restroom may be used by women during meetings and times when restroom facilities are needed for both men and women.

Telephone service should be provided in the vocational agriculture office.

Proper ventilation of the office should be considered in planning and constructing the office.

Agricultural Mechanics Laboratory

Considerable study and planning should be undertaken when planning the agricultural mechanics laboratory. Mechanization is progressing so rapidly that plans for the future should certainly be considered when planning the agricultural mechanics laboratory. Buildings are normally used for 20 to 30 years, therefore, adequate space should be provided to meet anticipated needs.

Cost is necessarily a major factor in determining shop size, but unless sufficient space is allowed for students to work safely and freely, the instructional program may be severely handicapped.

Location

The most desirable location for the agricultural mechanics laboratory is adjacent to the vocational agriculture classroom or office. This allows the teacher's office to be located in such a manner that he can properly see and supervise both the classroom and the agricultural mechanics laboratory.

When the vocational agriculture department is a wing of the main school building, the shop should be placed at the greatest possible distance from study areas of the school.

The agricultural mechanics laboratory should be easily accessible to the public and sufficient parking space should be available.

Space

A minimum of 125 to 150 square feet of floor space per pupil in the largest anticipated class should be allowed.

Large work areas, which are free of columns or posts and not obstructed by permanently placed power equipment, should be provided.

The minimum size as listed in the current Texas guide is a minimum of 1800 square feet.(6) This size is entirely too small to meet the present needs for teaching in vocational agriculture. During an age of mechanization, farm equipment size has increased considerably causing a demand for more shop space.

To provide an effective shop instructional program, a minimum of 2400 square feet should be provided for the shop. (2) This is the recommendation of Colorado (13), Illinois (9), Alabama (15), Minnesota (2), and Wisconsin (11).

The shape of the shop should be rectangular or square. The minimum width should be 40 feet as recommended by Arizona (3) and Nebraska (14). The length will vary to provide the necessary floor area.

The expandable end of the shop should not be blocked with other buildings or property lines, so that if there is a need for additional space, the building length may be extended.

Ceiling Height and Materials

There should be a 14 foot clearance between the floor and bottom of the roof structure. This provides adequate height for entrance of large farm machinery.

If the roof structure is exposed, the roof deck should be acoustical form boards or light painted metal.

Floor

A concrete floor, 6 inches thick and properly reinforced, is sufficient for all areas.

Drains should be included in the floor. The number will vary according to the size of the agricultural mechanics laboratory. The floor should slope toward the drains which should adequately drain the entire shop.

Windows

All window sills should be at least 72 inches in height from the floor, which prevents distractions from outside the shop. It will provide adequate natural light and ventilation, and also will provide ample wall space for tool cabinets and work benches to be constructed under the windows.

The window sill should slope downward at a 30 to 45 degree angle which will help prevent accumulation of dust and debris. This will also prevent the student from laying tools on the sill.

Metal framed windows with small panes are recommended.

For ventilation purposes, windows should be located on at least three sides of the building.

Overhead Hoist
A rail mounted overhead five ton hoist leading from the vicinity of the service door to the machinery work area should be provided. Overhead beams should be strengthened to furnish adequate support for loads lifted with this hoist.

If an overhead chain hoist is to be installed, it should have a curved track to one one side of the building. When the hoist is not in use, it can be rolled to the side of the shop and consequently, will not interfere with shop instruction. Some instructors prefer a portable type of hoist to the overhead type. The type of structure to be used should be determined upon local needs and desires.

Doors
At least three outside doors are desirable. Two doors should accommodate pedestrian traffic and provide exits in case of fire.

A service door should be conveniently located in relation to the service drive. Usually an end location is best. The service door should be 14 to 16 feet wide and at least 12 feet high. Due to the size, this door should be raised and lowered by an electric motor or chain hoist.

One of the standard personnel doors should be located near the service door so that movement to and from the shop may be accomplished without opening and closing the service door. The service door and personnel door near it should open onto or adjacent to a surfaced apron.

Lighting
Ease of maintenance should be considered when planning the lighting system. Pilot light switches should be located at each entrance.

Flourescent type light, free of glare or shadows, is recommended; at least 30 foot candles should be provided for the general shop area and at least 75 foot candles over work benches and power tools.(13)

Heating and Cooling
If the vocational agriculture department is a part of the main high school plant, the controls for the heating and cooling system should be independent of the controls used in the entire school plant.

The heating and cooling of the vocational agriculture classroom and shop should be individually room controlled. There will be many days that the shop will not need to be as warm or cool as the classroom.

Ventilation
Artificial ventilation is needed in the shop to remove welding smoke; and fumes and gases produced by engines; woodworking dust and paint fumes.

The removal of the smoke and gases from the shop is one of the most difficult problems. An exhaust system should be installed to remove smoke and gas from the welding area and metal working area of the shop. A large flue and a carefully built hood will remove smoke.

There should be two to five air changes per hour in the agricultural mechanics laboratory in order to provide adequate ventilation.

Workbenches and/or Work Tables
Six linear feet of workbench space per student is normally considered adequate;

however, a total of 40 linear feet should be considered as a minimum.(1)

The workbenches should be 24 inches wide and the height should be 32 to 34 inches.

The workbenches should be attached to the wall with welded triangular bench supports. Benches in the metal working area should be covered with steel plate 1/8-inch or more in thickness with the front edge protected by a 1 3/4- inch x 1 3/4-inch x 1/8-inch angle iron. The working surface of the carpentry benches could be built with 5/8" oak flooring laid over softer wood. The top should be sanded and finished with at least two coats of sealer followed with a coat of wax.

Work tables may be desirable to supplement the workbenches. Work tables should be constructed according to standards listed for workbenches with the length determined by the area to be served. The width should be three to four feet.

Color

The lower portion of the shop walls should be painted a color that will not readily show dirt. In some shops a five foot-four inch wainscot of structural glazed tile or face brick is being used.

The power equipment should be color coded according to current recommendations for safety standards. Following a safety color code similar to that used by industry will improve visibility and emphasize danger areas about the shop. High visibility yellow, alert orange, safety green, and fire protection red are the safety colors. The following colors are recommended by the Color Dynamics Safety Color Code in painting shop equipment:

Ivory - edges of tables or benches, tool rests, throats and jaws of vise.

Safety green - body of machines and benches.

High visibility yellow - controls on equipment. Protruding parts, low beams, and posts are marked with alternating yellow and black diagonal stripes.

Alert orange - parts of machines or equipment that might crush, cut, shock, or otherwise injure.

Fire protection red - marks location of fire fighting equipment.

Compressed Air

Compressed air should be piped throughout the installation so that a 50 foot hose with quick attachment fittings is capable of reaching all areas of the shop.

Electrical Circuits

The electrical distribution panel should be of sufficient amperage for present and future needs.

Since many of the power tools will be portable, careful planning for locations of power outlets is essential and should be in conjunction with workbench locations. Initial installations should be adequate, thereby eliminating the need for supplemental wiring.

It is desirable to place all 1/3 horsepower and larger motors on 220-240 volt, single phase current if possible.

The electrical power for the shop should be centralized on a master control that is capable of being locked. This is an excellent safety factor and allows the instructor to have full control over the use of power tools at all times. The control should be near the instructors office and be readily accessible to anyone in the shop. It is desirable that this control be equipped with a pilot light.

Individual auxiliary switches capable of being locked should be provided on all major power tools.

Grounded 120 volt convenience outlets should be placed at 10 foot intervals along the wall above workbenches and adjacent to all work areas.

Power outlets for large motors, wired for ample voltage, should be spaced every 20 feet in the work areas. Outlets should be provided near walls for permanently installed power tools.

Tilting arbor saws and similar pieces of equipment should be located away from the walls and should have outlets which are located in the floor.

If the design of the shop is such that work benches are in the center, overhead or flush floor outlets may be necessary. It is desirable that electrical power for portable tools be available at all work benches and all open work areas. Overhead reel .type extension cords should be located over the work areas near the middle of the building. The number needed will depend on the size of the building and the arrangement of the work areas.

For arc welders, 220-240 volt single phase 50 amp circuits are necessary. These outlets should be located five to six feet apart in the area set aside for arc welding.

One 220-240 volt and one 120 volt grounded type power outlet should be provided on the outside wall of the building near the service door.

Water Outlets

At least two water outlets on which a hose may be used will be needed. One should be near the welding area and the other on the outside wall adjacent to the paved apron. The outside water line should be at least one inch size for fire protection purposes.

An electrically colled drinking fountain should be provided in the shop.

If a locker room is not included in the facilities, the shop should have one wash basin for each five students or an appropriate industrial type wash basin which should be located near the classroom door.

Locks and Keys

The number of keys required for any shop should be kept at a minimum. All locks should be keyed alike and master keyed with the building system.

Painting Facilities

Spary painting and steam cleaning facilities are considered essential in the shop. As the demands for mechanization in agriculture increase, there will be a greater need for instruction in maintenance of equipment. One of the important phases of maintenance is cleaning and removing of dust, oil and grease, and maintaining a proper paint finish.

A separate room for painting and steam cleaning should be available. The combination use of the paint room and a livestock demonstration room should be investigated. This room, equipped with an exhaust system, would be used for steaming and painting equipment and/or washing and grooming livestock for shows and other livestock demonstrations.

Locker Room

A locker room should be included when constructing vocational agriculture facilities.

The locker room should contain one wash basin for each five students or an appropriate industrial type wash basin. Two urinals and one commode for each twenty students is adequate. There are installations where a shower is desirable, but this depends on the community and the policies of the instructor.

Clothing lockers should be included in the locker room. The number of lockers needed is based on the total number of vocational agriculture students enrolled. Two tiered lockers are normally most desirable.

If a locker room is not provided, the lockers must be located in the shop. When locating lockers in the shop, careful planning must be made so that the least amount of wall space will be used by the lockers.

Shop Storage Facilities

An effective shop instructional program requires many tools which must be conveniently, but safely, stored when not in use. Space is also needed for the storage of supplies and materials used in the vocational agriculture shop. Without storage space the shop quickly becomes untidy in appearance, inefficient in operation, and possibly dangerously cluttered with obstructions.

Cabinets, wall or bench mounted, may be provided to store tools in the work areas. Portable cabinets and tool carts may be used to supplement wall cabinets. A general tool storage room should be provided, and should contain from 100 to 150 square feet. This room may be used to store lumber and certain metals that need to be protected. A combination of wall and floor racks or overhead storage should be included in the materials storage room. It may be desirable to develop the area above the locker room and office into a storage area.

Special facilities should be provided for the safe storage of paints, fuels, and solvents.

Surfaced Apron

A paved apron should be provided for maintenance and study, temporary storage and display of equipment. The area will be more serviceable if it is covered with a roof. This facility should be located near the large service door.

It is desirable to construct holding pens for livestock in this area; loading facilities for livestock and machinery is also very desirable.

If a surfaced area is not provided at the service door, the soil will wash and blow away from the door, resulting in a water hole when it rains.

CHAPTER IV

CONCLUSION

The steps a vocational agriculture teacher may wish to follow in planning a vocational agriculture facility are as follows:

1. Survey the vocational agriculture needs in the community and attempt to anticipate future needs.

2. Seek advice of the Texas Education Agency personnel, teacher educators and other vocational agriculture teachers.

3. Observe well planned vocational agriculture facilities and obtain the vocational agriculture teacher and administrators recommendations for improvement.

4. Develop a plan for consideration by local school administrators.

5. Continually consult with the administrators, architech and contractor concerning the design and construction of the facility.

It is the authors desire that this report will aid school administrators and vocational agriculture teachers in planning adequate, well-designed vocational agriculture facilities that will serve their communities for many years in the future.

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